

AMENDMENTS TO THE CLAIMS

The claims in this listing will replace all prior versions, and listings, of claims in the application.

LISTING OF CLAIMS

1. (Previously Presented). An apparatus for performing speech coding in a CELP system, comprising:

an adaptive codebook in which previously synthesized execution signals are stored;

a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook comprising a first subcodebook in which excitation vectors composed of a small number of pulses are stored and a second subcodebook in which excitation vectors composed of a large number of pulses are stored;

a synthesized speech obtainer that obtains synthesized speech using excitation information acquired from said adaptive codebook and said stochastic codebook using linear prediction coefficients obtained by performing linear prediction coefficient analysis on an input speech signal;

a gain information obtainer that obtains gain information of said synthesized speech using a relation of said synthesized speech and said input speech signal; and

a transmitter that transmits said linear prediction coefficients, said excitation information and said gain information,

wherein said stochastic codebook comprises a controller that provides additional gain for respective excitation vector in at least one of said first subcodebook and said second subcodebook according to a distance between pulses of the excitation vectors in said first subcodebook and a computation system that obtains the excitation information using the gain controlled excitation vectors.

2. (Canceled).

3. (Previously Presented). The apparatus according to claim 1, wherein said controller provides the additional gain for the excitation vectors in said second subcodebook small when the distance between pulses of the excitation vectors in said first subcodebook is short, and provides the additional gain for the excitation vectors in said second subcodebook large when the distance between pulses of excitation vectors in said first subcodebook is long.

4. (Previously Presented). The apparatus according to claim 3, wherein said controller calculates the additional gain according to a following equation:

$$g = |P1 - P2| / L$$

wherein g is the additional gain, $P1$ and $P2$ are respectively pulse positions of the excitation vector in the first subcodebook, and L is a vector length.

5. (Canceled).

6. (Previously Presented). An apparatus for performing speech coding in a CELP system, comprising:

an adaptive codebook in which previously synthesized execution signals are stored;

a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook comprising a first subcodebook in which excitation vectors comprising a small number of pulses are stored and a second subcodebook in which excitation vectors comprising a large number of pulses are stored;

a synthesized speech obtainer that obtains a synthesized speech using excitation information acquired from said adaptive codebook and said stochastic codebook, using linear prediction coefficients obtained by performing linear prediction coefficient analysis on an input speech signal;

a voice determiner that performs a voiced/unvoiced judgment on said input speech signal using said linear prediction coefficients;

a gain information obtainer that obtains gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal; and

a transmitter that transmits said linear prediction coefficients, said excitation information and said gain information,

wherein said stochastic codebook has a controller that provides additional gain for respective excitation vectors in at least one of said first subcodebook and

said second subcodebook according to a distance between pulses of the excitation vector in said first subcodebook, and a computation system that obtains the excitation information using the gain controlled excitation vectors.

7. (Canceled).

8. (Previously Presented). The apparatus according to claim 6, wherein said controller provides the additional gain for the excitation vector in said second subcodebook small when the distance between pulses of excitation vectors in said first subcodebook is short, and provides the additional gain for the excitation vector in said second subcodebook large when the distance between pulses of excitation vectors in said first subcodebook is long.

9. (Previously Presented). The apparatus according to claim 6, wherein said controller calculates the additional gain according to a following equation:

$$g = | P1-P2 | / R$$

wherein g is the additional gain, $P1$ and $P2$ are respectively pulse positions of the excitation vector in said first subcodebook, and R represents a weighting coefficient and is a vector length L when a result of the voiced/unvoiced judgment indicates a voiced speech, and $L \times 0.5$ when the result of the voiced/unvoiced judgment indicates an unvoiced speech.

10 (Canceled).

11. (Previously Presented). An apparatus for performing speech coding in a CELP system, comprising:

an adaptive codebook in which previously synthesized excitation signals are stored;

a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook comprising a first subcodebook in which excitation vectors comprising a small number of pulses are stored and a second subcodebook in which excitation vectors comprising a large number of pulses are stored;

a receiver that receives linear prediction coefficients, excitation information and gain information transmitted from a coding side; and

a speech decoder that decodes a speech using said excitation information multiplied by said gain information, and said prediction coefficients,

wherein said stochastic codebook comprises a controller that provides additional gain for respective excitation vectors in at least one of said first subcodebook and said second subcodebook according to a distance between pulses of the excitation vectors in said first subcodebook and a computation system that obtains the excitation information using the gain controlled excitation vectors.

12. (Previously Presented). The apparatus according to claim 11, wherein said apparatus further comprises a linear prediction coefficient provider that provides said linear prediction coefficients to said stochastic codebook.

13. (Previously Presented). A method for performing speech coding in a CELP system, comprising:

providing additional gain for respective excitation vectors in at least one of a first subcodebook and a second subcodebook according to a distance between pulses of excitation vectors in said first subcodebook of a stochastic codebook having said first subcodebook in which excitation vectors comprising a small number of pulses are stored and said second subcodebook in which excitation vectors comprising a large number of pulses are stored;

obtaining excitation information using the additional gain provided excitation vectors;

obtaining a synthesized speech using excitation information acquired from an adaptive codebook and said stochastic codebook, using linear prediction coefficients obtained by performing linear prediction coefficient analysis on an input speech signal; and

obtaining gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal.

14. (Previously Presented). The method according to claim 13, wherein said method further comprises performing a voiced/unvoiced judgment on said input speech signal using said linear prediction coefficients.

15-16. (Canceled)

17. (Previously Presented). A recording medium readable by a computer, said recording medium storing a speech coding program comprising an adaptive codebook in which previously synthesized excitation signals are stored, and a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook having a first subcodebook in which excitation vectors comprising a small number of pulses are stored and a second subcodebook in which excitation vectors comprising a large number of pulses are stored, said speech coding program including computer instructions comprising:

controlling a gain for respective excitation vectors in at least one of said first subcodebook and said second subcodebook corresponding to a distance between pulses of excitation vectors in said first subcodebook of said stochastic codebook;

obtaining excitation information using gain controlled excitation vectors;

obtaining a synthesized speech using excitation information acquired from said adaptive codebook and said stochastic codebook, using linear prediction coefficients obtained by performing linear prediction coefficient analysis on an input speech signal; and

obtaining gain information for said synthesized speech using a relation of said synthesized speech and said input speech signal,

wherein said stochastic codebook comprises a controller that provides additional gain for respective excitation vectors in at least one of said first subcodebook and said second subcodebook according to a distance between pulses of said first subcodebook and a computation system that obtains the excitation information using the gain controlled excitation vectors.

18-19. (Canceled).

20 (Previously Presented). A recording medium readable by a computer, said recording medium storing a speech coding program comprising an adaptive codebook in which previously synthesized excitation signals are stored, and a stochastic codebook in which a plurality of excitation vectors are stored, said stochastic codebook having a first subcodebook in which excitation vectors composed of a small number of pulses are stored and a second subcodebook in which excitation vectors comprising a large number of pulses are stored, said speech coding program including computer instructions comprising:

providing additional gain for respective excitation vectors in at least one of said first subcodebook and said second subcodebook according to a distance between pulses of excitation vectors in said first subcodebook of said stochastic codebook;

obtaining excitation information using the additional gain provided
excitation vectors;

obtaining a synthesized speech using excitation information acquired from
said adaptive codebook and said stochastic codebook, using linear prediction
coefficients obtained by performing linear prediction coefficient analysis on an
input speech signal; and

obtaining gain information of said synthesized speech using a relation of
said synthesized speech and said input speech signal,

wherein said stochastic codebook comprises an instructor that selects one
of said first subcodebook and said second subcodebook corresponding to a
distance between pulses of the excitation vectors in said first subcodebook and a
switch that switches between outputs of said first subcodebook and said second
subcodebook according to the selection by said instructor.